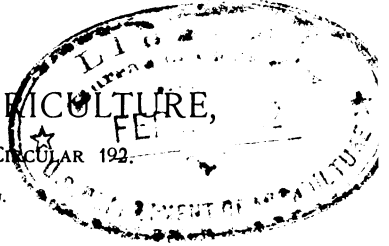


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# THE REGIONAL LYMPH GLANDS OF FOOD-PRODUCING ANIMALS.

BY

JOHN S. BUCKLEY,

*Assistant in Pathology, Pathological Division,*

AND

THOMAS CASTOR,

*Veterinary Inspector.*

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## THE REGIONAL LYMPH GLANDS OF FOOD-PRODUCING ANIMALS.

By JOHN S. BUCKLEY, D. V. S., *Assistant in Pathology, Pathological Division,*  
AND

THOMAS CASTOR, V. M. D., *Veterinary Inspector, Philadelphia, Pa.*

This paper dealing with the topographical anatomy of the lymphatic apparatus of food-producing animals has been written in an endeavor to meet a need that must be felt by practically every beginner in that branch of sanitary hygiene which has to do with the examination of meats and the organs or carcasses of meat-producing animals. It is regrettable that a more absolute knowledge does not exist of the anatomical detail of this system in the various food animals, but an endeavor has been made to supply as much as possible of the general knowledge that could be gleaned from the various works that treat of this subject, together with a fair amount of original investigation carried out by the writers of this paper.

Hitherto no great amount of special attention has been devoted in the veterinary schools to the study of the lymphatic system, but the prominence which has lately been given to the inspection of meats and carcasses of meat-producing animals necessitates a closer acquaintance with all that pertains to these structures, as intelligent judgment as to the fitness or unfitness of meats for human consumption is based largely on the conditions found in the lymph glands. As it is in the diseased carcasses that we find presented the ideal conditions for the best appreciation of the whole lymphatic apparatus, to the novice in meat inspection an exceptional opportunity is there afforded for its study which should on no account be neglected.

### DESCRIPTION OF THE LYMPHATIC SYSTEM.

The lymphatic system presents for study the lymph and its cellular constituents, the lymph vessels and lymph glands, together with certain accessory lymphatic structures which form a part of the system.

#### THE LYMPH.

The lymph itself is identical with the plasma of the blood and contains cellular elements which vary much at different periods and in different parts of the animals at the same time. In the intercellular lymph spaces and in the finest lymph radicles it has a poor cellular



content, while it possesses rich cellular contents as it leaves the lymph glands. These cellular elements are variously classified by different histologists, one of the most convenient classifications being that based on their size, form of nucleus, and structure, into large lymphocytes, small lymphocytes, polynuclear leucocytes, and transitional leucocytes. According to their granules and their staining characters they are classified as eosinophiles (or oxyphiles), basophiles, and neutrophiles.

#### THE LYMPH VESSELS.

Looking at the lymphatic apparatus in a normal healthy individual, we find it to be made up of a system of tubes or conduits, sometimes designated the white blood vessels, beginning as terminal culs-de-sac in the tissue interspaces, coursing as intricate and extensive networks in practically all tissues excepting muscles bundles (but they do not exist in the intermuscular sheaths), nerves, and blood vessels, and terminating finally as two large lymph vessels known as the thoracic duct and the great lymphatic vein, which empty into the blood vascular system near the junction of the jugular veins in the anterior vena cava.

Within the lymph vessels are situated involutions of the endothelial lining, forming valves which correspond to the valves of the veins, these valves being much more numerous, though, than in the veins. The smallest lymph vessels, i. e., the lymph capillaries, do not contain valves, nor are valves at all numerous in the thoracic duct, although several do exist at its juncture with the veins, these forming a contrivance to prevent passage of blood backward into the thoracic duct. But in all the vessels of an intermediate size the valves may readily be seen in injected preparations as constricted nodes about one-sixth of an inch apart.

In many respects the lymph vessels simulate the veins of the blood vascular system both in structure and function. They are, in fact, adjuncts of that system.

The capillary lymph vessels are formed by a single layer of endothelial cells, as are the smallest of the blood capillaries, and according to late investigations are said to have their origin in closed terminal culs-de-sac instead of open intercellular lacunar spaces.

Aside from the possession of valves, the intermediate and large lymph vessels are made up of three coats, as are the veins (an inner endothelial, a middle muscular, and an outer connective tissue envelope), and are said to divide about equally with the veins the absorbent functions. It is to be noted that those lymph channels of large size also possess elastic fibers, these acting in a mild degree for the impelling of the lymph onward toward the blood.

The lymph collected by the lymphatics from all parts of the body is finally emptied into the blood stream through the agency of the

two large vessels already mentioned—the thoracic duct and the great lymphatic vein.

The thoracic duct has its origin in a very irregularly shaped cystic dilation known as the reservoir of Pecquet, or the receptaculum chyli, situated beneath the first lumbar vertebra near the adrenals. From this origin it extends forward through the diaphragm (in cattle by a special opening), passing along the lower surface of the dorsal vertebræ and above the aorta to the apex of the thorax, and empties into the anterior vena cava. This duct receives the lymph from all parts of the body except from the right fore limb and the right half of the head, neck, and thorax. The thoracic duct is sometimes double throughout its extent, originating in the one reservoir and emptying at the junction of the two jugulars.

The great lymphatic vein, or the right lymphatic vein, is an extremely short trunk which receives the lymph from the right side of the head, neck, thorax, and right fore limb and empties into the venous system at the junction of the jugular veins or anastomoses with the thoracic duct just above the point of juncture with the anterior vena cava. It is formed by the efferents of the prepectoral glands of the right side.

#### THE GLANDS.

On the course of the lymph vessels are interpolated adenoid structures called lymph glands. The glands are nodular organs, varying in size from almost imperceptible points to that of a hen's egg, and varying also as regards the species of animals. In form they may be flattened, round, cylindrical, or reniform. Usually, though, they are more or less reniform (i. e., kidney shaped). The lymph vessels approaching a gland enter, after breaking up into many branches, in an oblique direction on its convex border and are known as the afferent vessels. These are the conduits that convey the lymph directly from the various tissues to the respective or corresponding lymph glands. After having traversed a complex labyrinth of channels in the gland and having its composition altered both chemically and histologically, the lymph leaves the gland by the efferent lymph vessels which have their origin at the hilus of the gland, situated on its concave border. These efferent vessels either enter into another gland or pass directly to the receptaculum chyli, the thoracic duct, or the right lymphatic vein.

An idea of the structure of a gland may be gotten from a study of the lymph follicles in the walls of the intestines, and then of a plexus of lymph vessels, within the meshes of which are placed these simplified collections of germinating lymphatic cellular elements.

A lymph follicle as found in the intestinal mucosa is nothing more than a small round aggregation of proliferating lymph cells held in

an extremely delicate stroma of adenoid connective tissue and penetrated by a richly arborescent capillary arterial twig which furnishes it nutriment. Surrounding some of these aggregations of lymphatic cellular elements is an extremely delicate connective tissue capsule opening into and continuous with the surrounding lymph capillaries, much on the order of a Bowman's capsule covering a Malpighian corpuscle in the kidney.

The lymph gland might be considered to be nothing more nor less than a large collection of these simple lymph follicles held together by a connective tissue framework containing trabeculae which separate the follicles and surrounded by a thick capsule from which this framework takes its origin. Intermixed with the fibers of connective tissue are involuntary muscle fibers in the lymph glands of some of the lower animals. The individual follicles of this compound gland do not completely fill the alveoli formed by the trabecular framework, but are surrounded in each instance by a hollow space which corresponds to the space between the capsule mentioned above as surrounding a solitary follicle and the follicle itself. In the compound lymph gland these spaces are all continuous with one another toward the medullary portion of the gland. The follicles of the medullary portion are elongated structures and are known as the medullary cords. The intercommunicating follicular lymph spaces finally are continuous with the efferent lymph vessels of the gland. For convenience of description the structure of the lymph glands is usually described as being divided into a cortical and medullary portion, the only difference in the two being in the shape of the lymph adenoid structures, those in the cortical portion being round and called cortical follicles, and those in the medullary portion being elongated and known as medullary cords. The spaces surrounding the follicles and cords are known as the lymph sinuses, and it is through the sinuses that the lymph passes on its way from the afferent to the efferent lymph canals. It is while traversing these tortuous sinuses that the lymph is altered in composition. From a meat-inspection standpoint it is well to remember that foreign and deleterious matter that has been taken up by the lymph on its passage through the different tissues is oftentimes removed or destroyed either by a process of filtration or by chemical counteraction. This function of the gland is very important, as certain deleterious substances—such, for instance, as infectious micro-organisms (tubercle bacilli for a specific example)—if emptied unceremoniously by the lymphatics into the blood stream would probably be distributed over the whole organism and would likely set up a generalized infection—a septicemia—which would most probably soon terminate in death. The lungs, of course, filter out many germs that are thus emptied into the blood streams.

The bacteria filtered out or retained temporarily by lymph glands are often destroyed and disintegrated. However, such is not always the case, and bacteria may even pass through a lymph gland without leaving any trace of their passage. Many of the bacteria which are retained are chemically treated and disintegrated, or, not being destroyed, they produce disease of the glands. Other substances, such as particles of carbon, are filtered out and may be readily seen in the bronchial glands of nearly all old animals. Blood and other tissue pigments are seen in the glands where there has been a destruction of these tissues upstream. Parasites, too, are at times found in these structures.

The lymph as it leaves the gland is much altered. It is in the gland that some of the lymph corpuscles, which play such an extremely important part in the protection of the body from infections and injuries, are added to it. It is while thus passing through that the lymph acquires its property of coagulability, i. e., it receives its fibrinogenetic qualities. The lymph with its new qualities and new constituents, together with its load of modified waste from the tissues, is now ready to be emptied into the blood stream to be passed along to the excretory organs.

The statement that the lymph glands filter out and modify deleterious matters could not be very readily demonstrated by simple macroscopic means in a young, healthy animal, but it is clearly exemplified in cases of infections of individual organs and regions and in old animals where pigmentation of these glands is often observed. It is on such findings that the meat inspector is most often obliged to depend for basing his opinion of health or disease, and for deciding localization and generalization of disease and the fitness or the unfitness of meat for food purposes.

If the lymphatic system is the "scavenger of the body," if it protects the body from disease, it also furnishes a route of entry for disease, and in certain cases acts as a disseminator of disease. Those cancerous affections and infectious diseases of a malignant character which have by intent or chance become inoculated into the body are not long held in abeyance by the lymph glands, for the lymph conduits act as ways of transport in such cases, to the detriment of the whole body.

In consistency and color the lymph glands vary much. In young, rapidly growing animals the glands are quite prominent and juicy; in old and mature animals they are more firm and compact. Sometimes in old milch cows the lymph glands may be quite prominent, but are usually fibrous in texture. The splanchnic lymph glands are softer in structure than those in other parts of the body, those of the abdominal digestive organs being more juicy, especially during absorption from the intestines.

The interior parts of the mesenteric glands are usually darker in color than those of other regions. The colors that prevail are white, light gray, dark gray, mottled gray and brown, light brown, and sometimes red or even black.

The red lymph glands usually represent a special kind of gland known as hemo-lymph glands, the color being due to the presence of red blood cells in the sinuses. These are quite normal glands, and are thought by some to be transitional forms, or forms induced by alterations in other organs, especially the spleen, and by others are supposed to relieve the spleen of a part of its function in the metabolism of the blood. These small red glands usually occupy a position in the sublumbar region and are designated by Warthin as "spleenolymph glands" and "marrowlymph glands."

Black lymph glands, or mottled black and white, while not normal, can not be said to be always really diseased, since the color may be due to a mere deposition of normal pigment or to carbon particles which have no special significance, at least from a meat-inspection standpoint. The cortical portions of many lymph glands are white or light gray, while the medullary portions are rather dark in color. In many old animals the lymph glands are quite fibrous in texture, and on section are of a yellowish-white color.

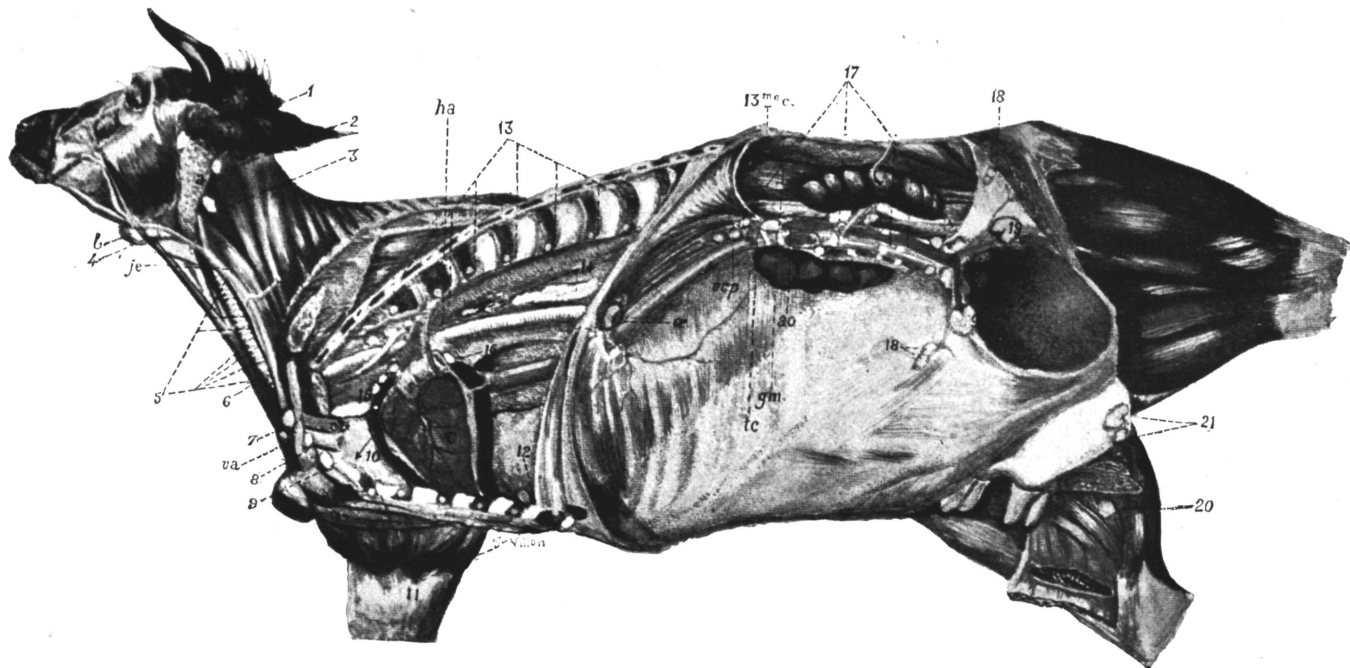
Although the routes of the lymph conduits are more or less constant, there may easily be diversions of the normal or usual flow of lymph, due to various causes, the most important of these being the retrograde movements, due to blocking of the lymph channels in disease, as in cancerous and other conditions. Anastomoses of lymph vessels of adjacent regions may occur, as in inflammatory adhesions of one lobe of the lung with an adjacent lobe, or adhesion between the visceral and parietal or the visceral and mediastinal pleura, etc. All such points must constantly be kept in mind in order to render intelligent judgment in a seemingly unexplainable finding.

#### THE SUBMAXILLARY LYMPH GLANDS.

The submaxillary lymph glands in cattle are located superficially in the lower portion of the inferior maxillary space, between the inner aspect of the inferior maxillary bone and the submaxillary salivary glands, about 2 inches anterior to the point where the lower border of the inferior maxillary bone curves abruptly upward and above the anterior attachment of the sterno-maxillaris muscle. Usually there is but one node on each side, but at times there are two glands lying very close to each other. (See Pl. XXX, 4, and fig. 27, b.)

In hogs, these glands lie, covered by the salivary glands, more posterior than in cattle. (See fig. 28, 9.)

Their afferent vessels, chiefly superficial, are derived from the mucous membrane of the anterior nares, the muscles of the lips,



### LYMPH GLANDS IN THE COW.

1, Parotid lymph gland; 2, atlantal lymph gland, or the most superior of the superior cervical lymph glands; 3, postpharyngeal lymph gland; 4, submaxillary lymph gland; 5, small glands on the median portion of the superior face of the trachea; 6, prescapular lymph gland; 7, 8, 9, prepectoral lymph glands; 11, inferior thoracic or suprasternal lymph glands situated along the course of the internal thoracic artery and vein; 12, sterno-diaphragmatic lymph gland; 13, superior thoracic or subdorsal lymph glands; 14, chain of lymph glands in the posterior mediastinal region; 15, lymph nodes along the inferior surface of trachea in the anterior mediastinal space; 16, posterior bronchial lymph gland, under the bifurcation of the trachea; 17, sublumbar lymph glands, at *ecp* the most anterior are at the origin of the celiac arteries; 18, external iliac or circumflex iliac lymph glands, at the angle of the haunch; 19, external iliac lymph glands at the angle of the crural trunk; 20, popliteal lymph gland; 21, superficial inguinal or supramammary lymph glands. (From Aureggio's "Album Guide.")

cheeks, and tissues of the anterior maxillary space, and from the anterior portion of the tongue. The efferent or outgoing lymph vessels pass to the superior cervical lymph glands.

In cattle the head is often severed from the carcass without removing the tongue and is so inspected, and in this case the submaxillary lymph gland is reached by making a longitudinal incision just within the angle of the inferior maxilla along the inner border of the sterno-maxillaris muscle, when it will be found adjacent to the submaxillary salivary gland. In other cases the tongue is removed from the head and hung up by its tip, when the gland may very easily be reached by grasping the side of the base of the tongue with one hand to draw the tissues tense, and then making one or more short transverse incisions to the inside of the sterno-maxillaris muscle and directly opposite to the arytenoid cartilage of the larynx. These incisions should cut directly through the submaxillary lymph gland, thus exposing it for inspection.

In hogs the method of reaching these glands varies with the method of slaughtering. In many of the smaller establishments where the killing is slow and the work of inspection is conducted by one inspector at the eviscerating bench, it is the custom to remove the liver, lungs, heart, and tongue without separating them, and in this case the submaxillary lymph glands may be easily removed from the carcass with the tongue if a good, wide incision is made and then both sets of glands may be readily located a short distance apart embedded in the fat on each side of the tongue; but it is necessary to distinguish between the lymph glands and the salivary glands, which are also removed by this method and lie adjacent to the submaxillary lymph glands. In the larger establishments where the killing is conducted very rapidly these glands are examined on the scraping or heading bench, the head being almost severed from the body by a free transverse incision at the throat, after which the glands may be readily found in the location previously described by

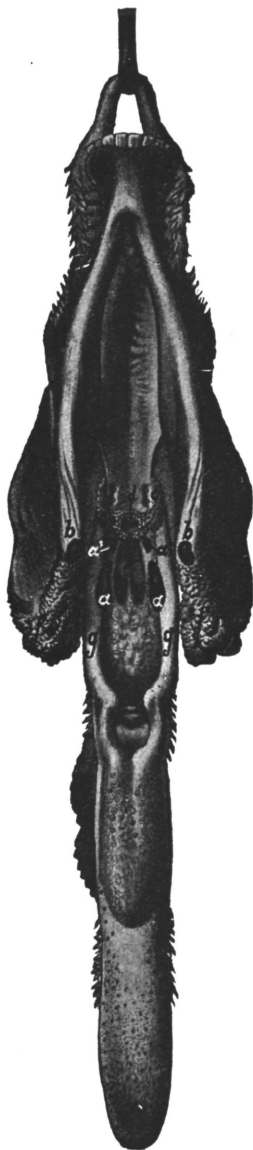


FIG. 27.—Head of cow, with tongue cut out. *a*, *a'*, Postpharyngeal or retropharyngeal lymph glands; *b*, submaxillary lymph glands; *c*, tonsils; *d*, posterior nares; *f*, submaxillary salivary gland; *g*, styloid process of hyoid bone. (From Edelmann's "Meat Hygiene.")

making a longitudinal incision through the salivary gland and into the adjoining submaxillary lymph glands, thus exposing them for inspection. Some inspectors use a small hook with which the salivary gland is drawn outward and twisted slightly, thus allowing the adjoining lymph glands to be exposed easily and rapidly with a small incision. Experience is necessary to locate them rapidly and accurately, so as not to delay or hinder the killing operations.

#### THE PAROTID LYMPH GLAND.

In cattle the parotid lymph gland is located at the supero-anterior border of the parotid salivary gland, being partly embedded in the same and partly lying on the masseter muscles about 1 inch in front

of and a little lower than the external meatus of the ear. (See Pl. XXX, 1.)

In hogs the parotid glands, very numerous, large, and red in color, are arranged in a chain along the anterior border of the parotid salivary gland and posterior to the border of the inferior maxillary bone. (See fig. 28, 1 and 1'.) On the killing beds it will be noticed that very often one or more of them are left intact on the inner surface of the jawl after the head is removed in that method

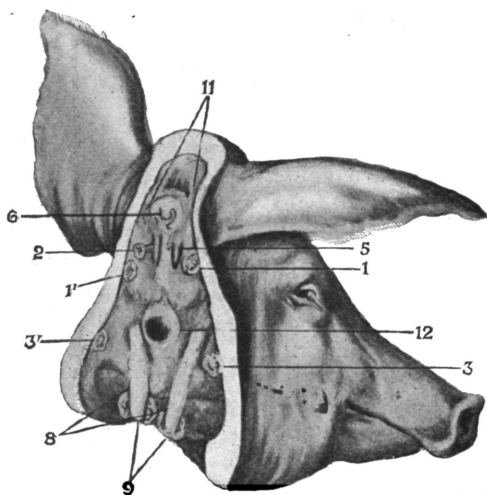


FIG. 28.—Head of hog, showing lymph glands. 1. 1'. Parotid lymph glands; 2, postpharyngeal or retropharyngeal lymph glands; 3, 3', superior cervical lymph glands; 8, submaxillary salivary glands; 9, submaxillary lymph gland on each side of the salivary gland in the intermaxillary space. (From Aureggio's "Album Guide.")

of slaughter where the jawls are allowed to remain attached to the carcass. Where the jawls are removed from the carcass with the head, as is done in many of the larger slaughterhouses, these glands may often be easily seen, as they are frequently cut through when the head is severed from the body, although in some cases they may be entirely removed with the head and jawls, or in others they may remain in the carcass, depending entirely whether the head is cut off long or short.

The afferent vessels, chiefly of the deep variety of lymphatics, are derived from the anterior and lateral portions of the head and from the temporal and parotid regions, the cranial cavity, the base of the cranium, the tongue, the soft palate, the esophagus, and the larynx. The efferent vessels pass to the superior cervical lymph glands.



## THE POSTPHARYNGEAL LYMPH GLANDS.

The postpharyngeal or retropharyngeal lymph glands are located in cattle at the base of the cranium just superior to the pharynx, lying close on either side of the median line between the branches of the hyoid bone. (See Pl. XXX, 3, and fig. 27, *a* and *a'*.) These glands consist of two quite large nodes, one on each side.

In hogs they are usually quite small and are situated more posterior than in cattle, on the lateral plane of the larynx and the pharynx at about the lower end of the styloid process of the occipital bone. (See fig. 28, 2, and Pl. XXXI, 24.)

They receive lymph radicles from the posterior nares, the cranial cavity, the posterior portion of the oral cavity, the tonsillar region, and the pharynx, also from the other lymph glands of the head. The tonsils, in cattle at least, have four or five large ducts that empty directly into the postpharyngeal glands.

The efferent lymph vessels pass to the other superior cervical glands that lie above the pharynx but more posterior and external to the hyoid bone—the parapharyngeal glands—after which they pass down along the trachea following the carotid artery to the middle cervical glands.

It will readily be seen how very important these glands are, from a meat-inspection standpoint, as they receive most of the efferent lymph radicles of the entrance to both the digestive and the respiratory tracts. Indeed, it is a matter of fact that these glands are often the very first to show tubercular infection. And, too, those animals affected with actinomycosis that have the postpharyngeal glands involved usually show nodules of actinomycotic growth in the lungs. This would appear to indicate that the lymphatics are not always a protective factor in disease, but in this case their efferents possibly furnish a route by which this disease soon gains entrance to the blood and is filtered out in the lungs.

These glands may be exposed in cattle as follows: Where they are examined in the head after its removal from the carcass, but before the tongue is cut out, draw the larynx downward with the hand (or upward and forward when the head is lying face downward, as is ordinarily the case), then make a free transverse incision near the base of the cranium, which will reveal the glands lying on the supero-posterior surface of the pharynx. If the tongue has been cut out and hung up by its tip, it is a very simple matter to examine the glands as they are exposed to view on the wall of the pharynx at the superior part of the base of the tongue. When the pharynx is not opened up longitudinally they lie almost adjoining each other in the median line, whereas if it is opened, as it should be, to clean it of particles of food, mucus, etc., the glands will drop somewhat—one to each side—but hanging in full view at the level of the anterior

border of the arytenoid cartilage. This position will of course vary somewhat when the tongue is hung up by its base, as is sometimes done.

In hogs the method of locating these glands is similar to that described for the submaxillary glands, the only difference being the slight difference in location, the postpharyngeals being located in a mass of fat at each side of the larynx and pharynx, and not so large or prominent as the submaxillary glands.

#### THE CERVICAL LYMPH GLANDS.

The term "cervical lymph glands," as used in the meat-inspection regulations and reports of the Bureau of Animal Industry, includes the submaxillary, the superior cervical, the postpharyngeal, the parapharyngeal, and the parotid lymph glands. These are very important to the inspector, and it is necessary to examine them carefully. In hogs especially the cervical lymph glands frequently present the first and often the only lesions of tuberculosis found in the entire carcass.

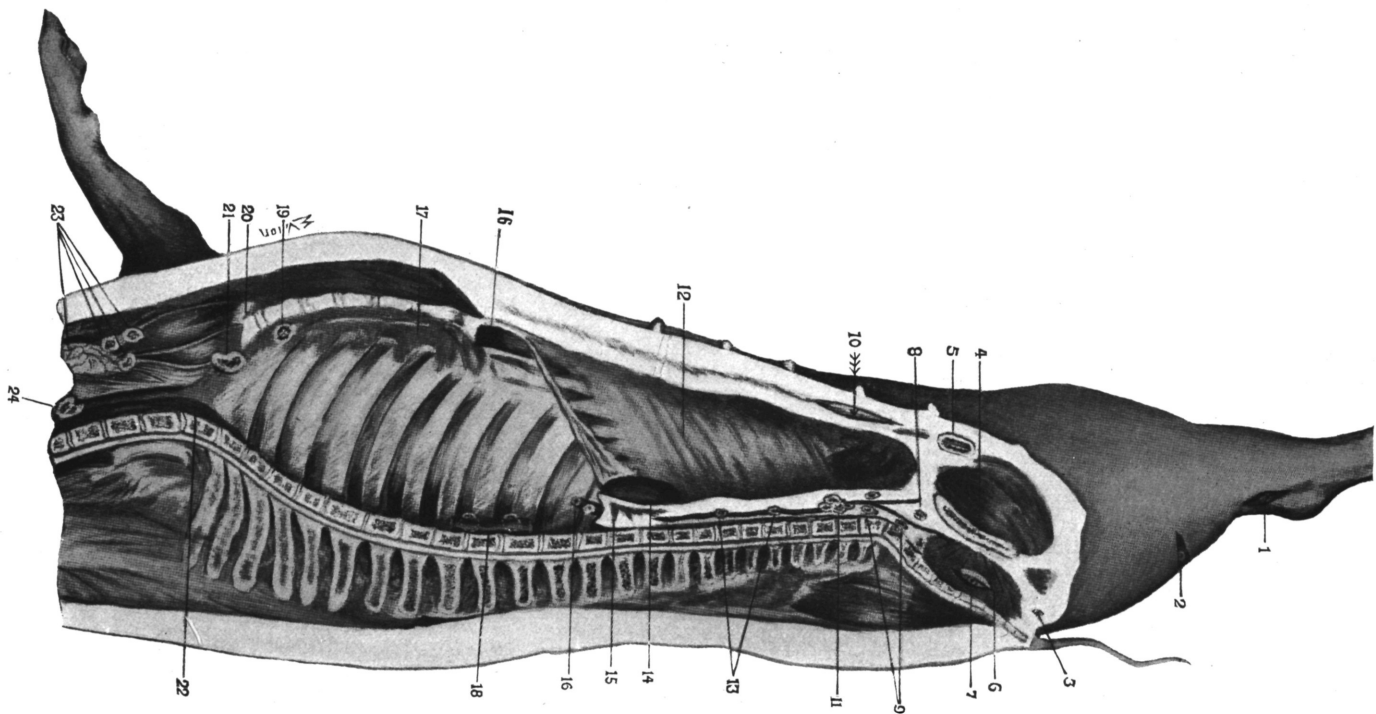
When tuberculous lesions are found in any of the cervical lymph glands in a carcass that is to be passed for food or lard, the head and tongue should be condemned and tanked, or may be passed for lard, depending upon the extent and severity of the lesions, but if passed for lard all the cervical lymph glands should be carefully trimmed out, and in either case all of the lymph glands of the neck region, including the prepectoral, the prescapular, the middle cervical, and the deep or supplementary cervical glands, should be thoroughly trimmed out and tanked.

#### THE SUPERIOR CERVICAL LYMPH GLANDS (ATLANTAL, PARAPHARYNGEAL, AND ANTERIOR CERVICALS).

These glands are located in cattle at the extreme superior end of the submaxillary salivary gland, just under the styloid process of the occipital bone, and bordering the lateral aspect of the occipito-atloid articulation just above the pharynx. They consist of a small group, two or three in number. (See Pl. XXX, 2, and Pl. XXXII, 7'.)

The superior cervical glands in hogs are very important ones to examine for tubercular infection. See also the middle cervicals, which are continuous with these in the hog. (See Pl. XXXI, 23, and fig. 28, 3 and 3'.)

They receive afferent vessels from the immediate surrounding tissues, and the efferent branches from the three preceding glands. Their efferents pass, accompanying the large blood vessels lying beside the trachea, to the inferior cervical glands, at times directly, at times through one of the small glands, interposed on their course, known as the middle cervicals.



LYMPH GLANDS IN THE HOG.

- 1, Incision to expose the gland of the hock; 2, popliteal lymph gland; 3, anal lymph gland; 5, superficial inguinal lymph gland; 6, internal obturator muscle; 7, ischial lymph gland; 8, posterior node of the internal iliac lymph glands; 9, subsacral lymph glands; 10, incision to expose the external inguinal lymph glands; 11, group of lymph glands in the sublumber region, continuous with the internal iliacs; 13, sublumber lymph nodes; 14, kidney; 16a, sterno-diaphragmatic lymph gland; 18, small lymph nodes along the aorta; 19, inferior thoracic or suprasternal lymph gland; 21, prepectoral lymph glands; 23, glands of the median cervical region, seen usually still attached in the dressed carcass; 24, postpharyngeal or retropharyngeal lymph glands. (From Aureggio's "Album Guide.")

## THE MIDDLE CERVICAL LYMPH GLANDS.

These are small glands, several on each side, against the wall of the trachea and esophagus, just a little lower than the thyroid gland. (See Pl. XXX, 5.) Large nodes are never present except occasionally in the sheep. It will be found that the efferent lymph vessels of the superior cervical glands pass through the nodes that may be present. These glands receive afferent radicles from the esophagus and the trachea. Their efferents pass directly to the prepectoral lymph glands. In hogs these glands are continuous with the superior cervical chain which extends upward to the occipital bone. (See Pl. XXXI, 23.) In cattle they are often absent.

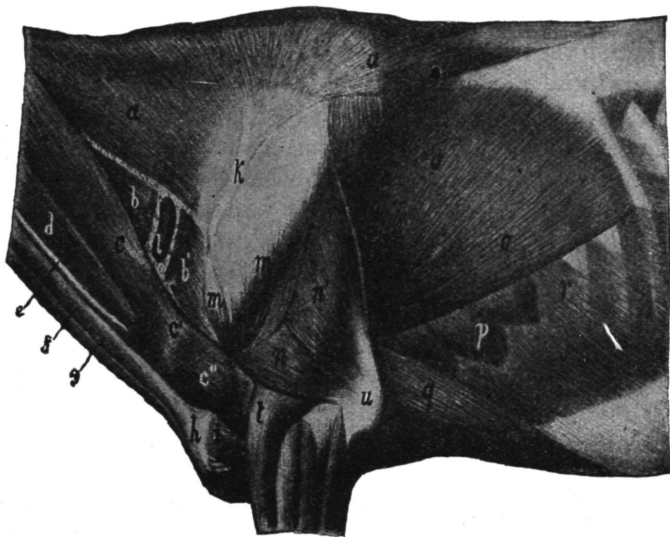


FIG. 29.—Left fore quarter of helper, with exposed prescapular lymph gland. *a, a*, Cervical trapezius muscle; *b, b'*, omotransversarius muscle; *c, c'*, brachiocephalic muscle; *b*, prescapular lymph gland. (From Edelmann's "Meat Hygiene.")

## THE PRESCAPULAR OR SUPERFICIAL CERVICAL LYMPH GLANDS.

These glands are located a little above and inward from the shoulder joint, embedded in a cushion of fat and covered by the mastoidohumeralis muscle. This gland in cattle consists of an elongated voluminous glandular node (see Pl. XXX, 6, and fig. 29, *b*); in hogs, a more or less completely fused chain. They play an important part in deciding the question of generalization of disease—in tuberculosis, for example—as the afferents are all derived from centripetal lymph ducts, i. e., from ducts that are not connected with any other lymph area. In other words, this lymph area is an isolated area, so that any secondary infection coming in it must first be brought to this area through the medium of the blood vessels. Perhaps inflammatory conditions which would cause anastomoses with the lymph

vessels of an adjoining region might take place. In this manner pleural lymph radicles could become fused with deep-lying lymph vessels on the pectoral wall, and these in turn pass over the shoulder to the prescapular glands. It would seem that such a roundabout course would almost never take place. Of course disease of these glands without other centers of infection would point to a primary local infection.

The afferent radicles are derived from the superficial parts of the shoulder, the upper and lower leg, the posterior portion of the lateral pectoral wall (the vessel in this latter case passing to these glands across the muscles of the shoulder), from the superficial parts of the base of the neck, and from part of the inner face of the scapular region.

The efferent vessels pass to the prepectoral lymph glands, i. e., the inferior cervicals.

The glands may usually be felt in live cattle by pressing the hand forcibly in the hollow of the shoulder, about in front of the neck of the scapula. In a side of beef in the hanging position a small cut parallel to the muscle fibers along the superior border of the mas-toido-humeral muscle, 3 inches in length, just inward from the shoulder joint, will be sufficient for the inspector to reach in and secure the gland for examination. The muscle can then be laid back in place, flattened out with the hand, and held there with a skewer, so that when the carcass cools it will be scarcely possible to notice any sign of the muscle having been disturbed. It may also be reached for examination from the inner surface of the split beef carcass by making a longitudinal incision through the neck muscles in the jugular gutter just anterior to the scapulo-humeral articulation. This method is preferred by many inspectors.

In hogs it is easiest reached from the internal or split surface of the carcass by making a transverse cut just in front of the shoulder joint from the nape of the neck to the trachea some distance anterior to the first rib, and the lymph gland will be found to occupy a place about in the middle of the incision.

It is also quite important to examine these glands in sheep to detect diseases such as caseous lymphadenitis. In sheep the glands are located as in cattle. (See Pl. XXXII, 9.)

This gland, like the other bond glands, is, as a rule, only examined in the final examination of retained carcasses, as to expose them mutilates the carcass more or less.

#### THE DEEP CERVICALS OR SUPPLEMENTARY CERVICAL LYMPH GLANDS.

These glands are located, in hogs, above the superficial cervical glands beneath the angular muscle of the scapula, external to the lower part of the second cervical vertebra, embedded in a mass of fat.

The afferent vessels are from the deep muscular layers of the base of the neck. The efferent vessels pass to the superficial cervical or prescapular gland.

In cattle this gland does not exist.

This gland can be reached in the hog after the carcass has been split by cutting through the neck muscles inferior to the first and second cervical vertebræ. To reach the gland in this manner mutilates the neck somewhat and occasionally the shoulder to a slight extent. A still better way—as it causes very little mutilation—is, in the hanging, split decapitated carcass to make a free upward incision between the neck muscles covering the first and second cervical vertebræ and the layer of superficial fat, when the gland can be readily reached in a cushion of fat somewhat anterior to the scapula and torn loose and brought out for examination.

This gland is considered in the work of the Bureau of Animal Industry as a portion of the prescapular glands and should be so named in making out reports.

In the superficial parts of the base of the neck and shoulder there are also several other very small lymph nodes.

#### THE AXILLARY OR BRACHIAL LYMPH GLANDS.

These glands are located in cattle on the inner aspect of the internal scapular muscles, posterior to the shoulder joint, in the midst of the brachial vessels and nerves where these emerge from the thorax and enter the leg. They are variable in number and usually are smaller and more flattened than any of the glands so far described.

The axillary lymph glands are most often missing in swine, and the lymph of this region empties into the median or inferior cervicals.

The gland is accessible only from the external surface after removing the scapula, which is ordinarily impracticable in a food carcass, but may be easily reached in cattle from the inner surface of the split carcass, as it lies just external to the first or second rib (usually the latter) at about midway between its two extremities; and by cutting through the muscles along the anterior border of the first rib near its center the gland may be readily located embedded in a cushion of fat external to the first or second rib. This gland is not examined in the ordinary post-mortem meat inspection.

They receive their afferent rootlets from the middle and inner scapular region, from the lower arm, forearm, and foot, and from the thoracic walls. Their efferent vessels pass to the prepectoral or inferior cervical glands.

#### THE PREPECTORAL OR INFERIOR CERVICAL LYMPH GLANDS.

In cattle and hogs these glands are located at the entrance to the thorax on and between the lower anterior borders of the two first ribs laterally and inferior to the trachea and esophagus, extending

into the fore part of the anterior mediastinum, usually embedded in fat that also acts as a cushion for the large veins and arteries at this location. (See Pl. XXX, 7, 8, 9; Pl. XXXI, 21, and fig. 30, *b*.)

These are very important glands to examine, as they are the terminal glands through which all the lymph from the head, neck,

and fore extremities passes on its way to the thoracic duct and the right lymph vein. They also receive the efferents of the suprasternal lymph glands on their passage to the thoracic duct and from several small lymph nodes in the anterior mediastinal space. They bear the same relation to the anterior portion of the body as do the sublumbar glands to the vessels of the posterior regions. The efferents of the prepectoral glands on the right side empty into the great lymphatic vein, and on the left side into the thoracic duct or occasionally into the anterior vena cava. These glands are frequently found to be affected with tuberculosis, so occa-

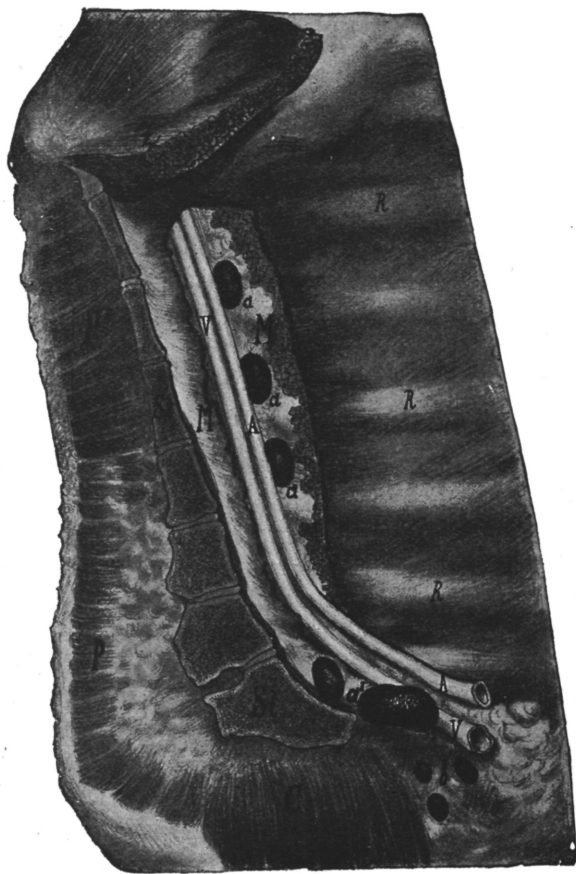


FIG. 30.—Portion of left thoracic wall of heifer. *A*, internal thoracic artery; *V*, internal thoracic vein; *M*, triangular muscle of the sternum cut through; *a*, inferior thoracic lymph glands; *a'*, anterior mediastinal lymph glands; *b*, inferior cervical or prepectoral lymph glands. (From Edelman's "Meat Hygiene.")

sionally lesions of that disease may be thus detected even after the viscera have been removed and disposed of.

These glands, or at least a portion of them which always remain in the hanging split carcass of beef, may be easily reached by inserting the knife into the cut end of the large venous trunk above referred to and making a downward longitudinal incision parallel to the fibers of the long muscles of the neck, where the gland may be readily found embedded a short distance in the fatty cushion.

Proceeding somewhat in the order of examination of the carcass as it is conducted at the time of evisceration, or following the plan of inspection by passing from terminal to central lymph structures as the lymph flows, we have the following glands:

#### THE POPLITEAL LYMPH GLANDS.

The popliteal lymph glands are located deep in the muscles behind the knee joint on the gastrocnemius between the semitendinosus and biceps femoris muscles at about the point of bifurcation of the gastrocnemius. (See Pl. XXX, 20, and Pl. XXXII, 1, 1'.)

In hogs the popliteals are absent in some instances, but there exists always a very small gland in the subcutaneous tissues 3 or 4 inches above the hock. (See Pl. XXXI, 1, 2.)

The popliteal gland is not examined ordinarily, this not being considered necessary except in special cases, as it mutilates the carcass considerably to expose it. To reach it in the hanging cattle carcass, make an incision on the posterior part of the thigh, parallel to the muscle fibers, between the biceps femoris and the semitendinosus muscles, on a line from the point of the ischium to the point of the os calcis, at the intersection of a horizontal line drawn backward from the center of the patella. The fingers may then be thrust in between the muscles to the cushion of fat between the heads of the gastrocnemius, where the gland may be readily located.

The afferent vessels are from the lower portion of the hind leg. The efferent vessels follow the sciatic nerve, pass upward to a lymph gland (the ischial) lying on the outer portion of the ischium in the middle of the lesser ischiatic notch, thence to the posterior sublumbar gland. At times they pass by this gland without entering it and pass directly to the sacral or sublumbar or the internal iliaes.

#### THE ISCHIAL LYMPH GLANDS.

These glands are located on the deepest and outer part of the lesser ischiatic notch, adjacent to the external surface of the bone, covered by the broad ligament of the pelvis, on the ventral border of the coccygeal muscle. (See Pl. XXXI, 7.)

The afferent vessels are derived from the surrounding region and from the efferent branches of the popliteal glands. Sometimes the efferents of the popliteals pass quite near to this gland without entering it.

The efferent vessels of this gland pass to the sacral and sublumbar glands.

#### THE PRECRURAL, KNEEFOLD, OR EXTERNAL SUBILIAC LYMPH GLAND.

This gland forms a voluminous mass located in the loose cellular tissue of the flank just above and inward from the femero-tibial articulation on the anterior border of the tensor fascia lata muscle.



(See Pl. XXXI, 10, and fig. 31, *l*.) In animals in good condition

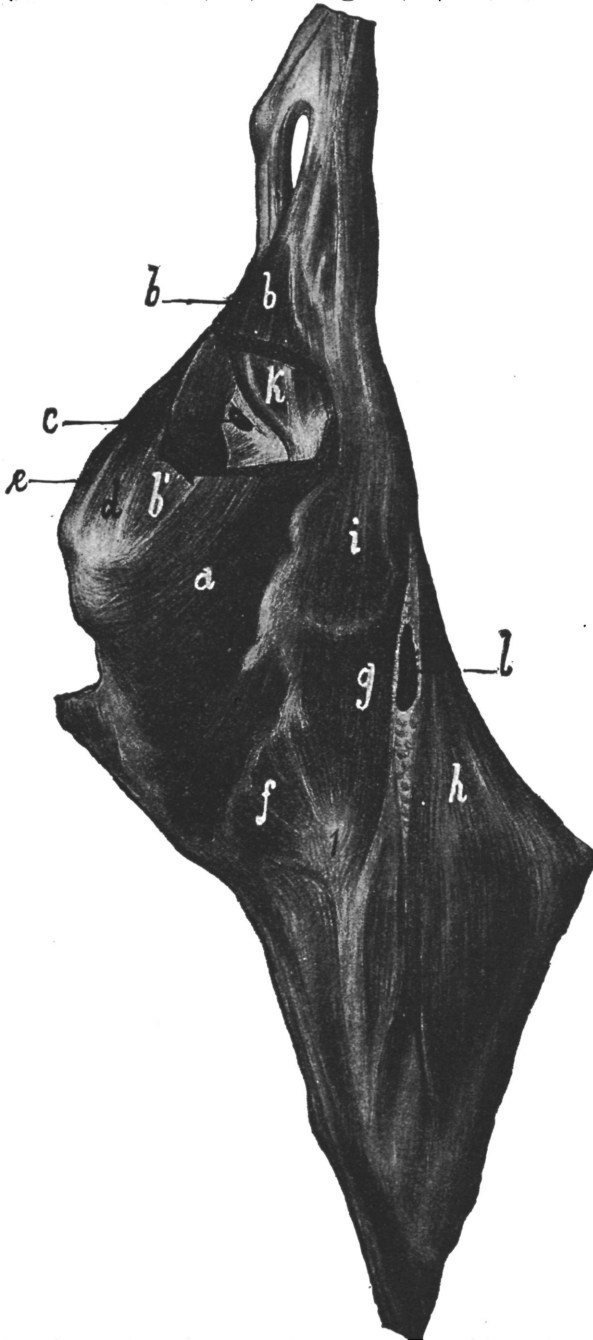


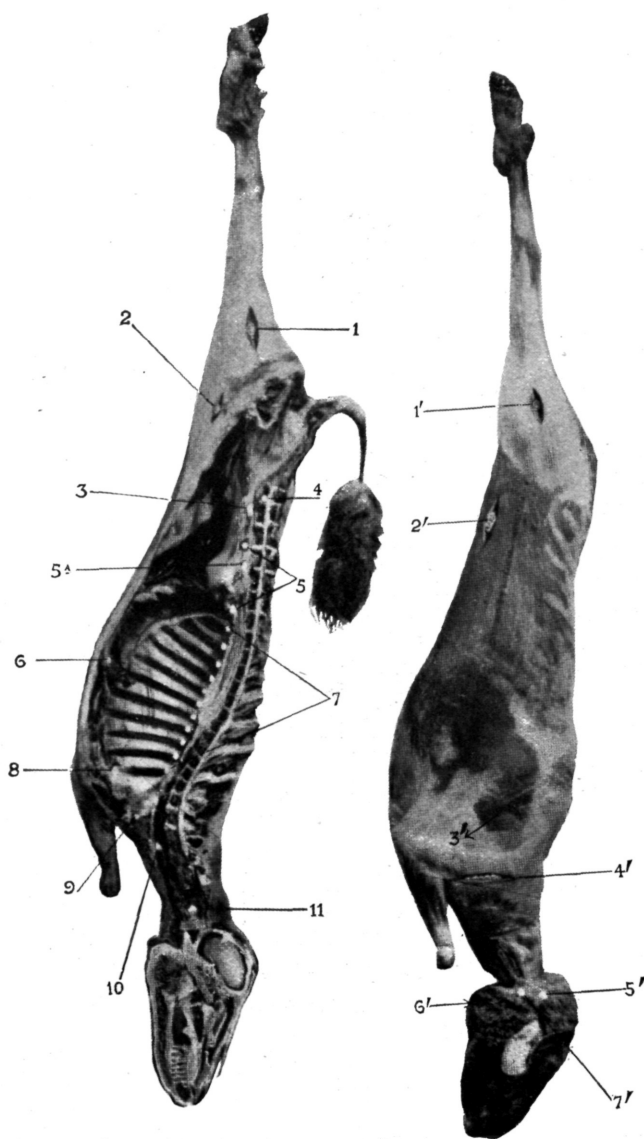
FIG. 31.—Left hindquarter of steer, external view. *c*, Popliteal lymph gland; *l*, precrural lymph gland; *b*, *b'*, biceps femoris muscle; *e*, semimembranosus muscle. (From Edelman's "Meat Hygiene.")

gland can be readily found with the least

it is embedded in a mass of fat. It is one of the most accessible glands in the dressed carcass, and is quite as important from the meat-inspection standpoint as is the prescapular gland in the fore quarters. In sheep this gland is very often affected with disease, and it is quite important to keep this in mind at the time of inspection. (See Pl. XXXII, 2'.)

The afferent lymph ducts are derived in part from the lateral abdominal wall, in part from the superficial aspect of the thigh, and from the outer and superior portions of the hind extremities, also from the large crural muscles. The efferents pass upward several inches along the fascia lata muscles, pass through the abdominal wall, and enter the circumflex iliac lymph glands by several large vessels.

In the hog this mutilation of the



LYMPH GLANDS IN THE SHEEP.

1, 1', Popliteal lymph gland; 2, superficial inguinal lymph gland; 2', precrucial lymph gland; 3, internal iliac lymph gland; 4, 5, sublumbar lymph glands; 5A, renal lymph gland; 6, sterno-diaphragmatic lymph gland; 7, superior thoracic or subdorsal lymph glands situated along the aorta; 8, supra-sternal lymph gland; 4', 9, prescapular lymph gland; 10, small nodes along the superior face of the trachea; 11, superior cervical or postpharyngeal lymph gland; 3', axillary lymph gland; 5', parotid lymph gland; 6', submaxillary lymph gland; 7', atlantal or preatloidian lymph gland. (From Aureggio's "Album Guide.")

carcass by making a free incision through the inner abdominal wall nearly perpendicular to the vertebral column and in front of and above the femero-tibial articulation. In cattle it is easiest reached from the external surface of the carcass in the region known to the butcher as the "fel," by cutting down somewhat more deeply than is ordinarily done by the butcher in dressing a beef carcass, or by making a longitudinal incision into the "fel" along the anterior border of the tensor fascia lata.

### FLANK LYMPH GLANDS.

In cattle in the region of the flank there are also often a small number of small subcutaneously located glands which receive lymph from the surrounding superficial region. Their efferents pass to the precrurals or to the circumflex iliacs, which are quite near but on the other side of the abdominal wall.

### THE SUPERFICIAL INGUINAL AND SUPRAMAMMARY LYMPH GLANDS.

The superficial inguinal lymph glands are located in male animals at the neck of the scrotum beside the penis in front of the inguinal ring; in castrated males they are embedded in the scrotal fat (cod fat). (See fig. 32, *a*.) In cows these glands are situated bilaterally at the postero-

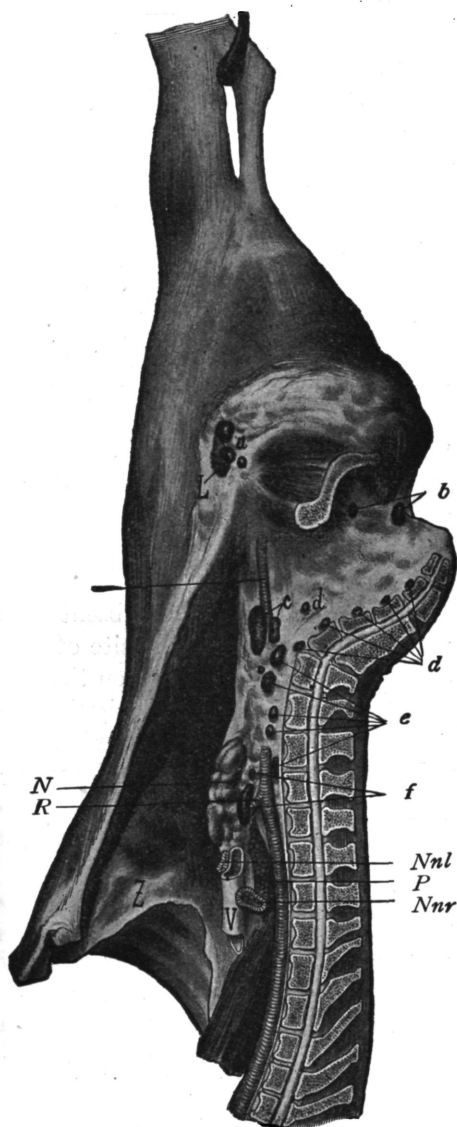


FIG. 32.—Left hindquarter of bull, internal view. *a*, Superficial inguinal lymph glands; *b*, anal lymph gland; *c*, internal iliac lymph glands; *d*, sacral lymph glands; *e*, sublumbar lymph glands; *f*, renal lymph glands. (From Edelman's "Meat Hygiene.")

superior part of the mammary gland and are known as the supramammary lymph glands. (See Pl. XXX, 21.) In hogs the supramammary lymph glands are located relatively as in cattle, there

being one or more nodes on each side situated posterior to the last segment of the compound mammary glands. (See Pl. XXXI, 5.) Occasionally all or a portion of them are removed when the hams are "faced" on the killing beds, although usually they remain and are found, in the hanging carcass, embedded in fat on a line drawn laterally from the anterior border of the pubis.

The afferent vessels are received from the posterior abdominal wall, the thigh, and the external genitals in the male, and from the posterior abdominal wall, the thigh, and the mammary gland in the female. The lymphatics of the mammae are very rich and their lymph glands are among the largest of the whole body.

The efferent vessels pass to the small deep inguinal glands located in the inguinal canal and to the internal iliac lymph gland.

The supramammary lymph glands are of the utmost importance as indicating the state of health or disease of the mammary gland, and on post-mortem inspection of a food animal they should be closely examined, as primary disease of the udder is of common occurrence in hogs, cattle, and sheep, but especially in cattle. (See Pl. XXXII, 2.)

#### THE INTERNAL OR DEEP INGUINAL LYMPH GLANDS.

These glands are often absent but are located occasionally in food-producing animals at the site of the entrance of the inguinal vessels into the abdominal cavity on the upper border of the inguinal canal. They are very small and insignificant so far as meat inspection is concerned, but their presence has been demonstrated in young animals by injection with quicksilver. They receive some of the efferent branches of the superficial inguinals. Their efferent vessels pass to the sublumbar glands or direct to the receptaculum chyli.

The deep inguinals in the horse lie at the superior entrance of the inguinal canal surrounding the femoral vessels, and receive lymph from the posterior limb and superficial inguinal glands, while their efferents pass to the internal iliac glands or direct to the receptaculum chyli.

#### THE SACRAL LYMPH GLANDS.

Located along the inferior face of the sacrum, near its lateral border, these glands are very small and correspond in position to the glands lying along the spinal column in the dorsal and lumbar region. (See Pl. XXXI, 9, and fig. 32, *d*.) They receive their efferents from the coccygeal region, postero-superior sacral region, and rectum. Their efferents pass to the sublumbar glands. Along the superior surface of the rectum are numerous small glands whose efferents pass to the sacrals or sublumbar glands.

## THE EXTERNAL ILIAC OR CIRCUMFLEX ILIAC LYMPH GLANDS.

These glands are located in the angle of bifurcation of the deep circumflex iliac arteries, near the inferior border of the external angle of the ilium and bordering the iliac psoas and external border of the great psoas muscles. (See Pl. XXX, 18.)

Their afferent vessels are derived from the postero-internal walls of the abdomen, the efferent vessels of the precrural lymph glands and branches from the lateral surface of the upper part of the thigh. Their efferent vessels pass to the sublumbar lymph glands and through these to the receptaculum chyli.

In cattle this is a single gland about the size of a hickory nut and can only be reached after considerable mutilation of the carcass; consequently it is not ordinarily examined.

## THE INTERNAL ILIAC LYMPH GLANDS.

In cattle this is a large heart-shaped gland 2 or more inches in diameter, located at about the upper third of the pelvic arch in the obtuse angle formed by the external iliac artery and the abdominal aorta. (See Pl. XXX, 19, and fig. 32, *c*.) In hogs there are several glands at this location which appear continuous with the sublumbar. (See Pl. XXXI, 8, 11.)

The afferent vessels are derived from the precrural lymph glands, the superficial inguinal glands, the walls of the posterior abdominal and pelvic cavities, and from the rectum, internal genital organs, urinary bladder, pelvis, and sacrum. The efferent vessels pass, some to the sublumbar glands and some direct to the receptaculum chyli.

In a hanging beef carcass this gland may be easily felt by placing the hand on the inner face of the ilium at about the upper third of the border of the pelvic arch.

## THE ANAL LYMPH GLANDS.

These are very small glands, located in the fatty tissue on the floor of the pelvis laterally from the anus. (See Pl. XXXI, 3, and fig. 32, *b*.) The afferent vessels are derived from the anal region, the root of the tail, and surrounding tissues. The efferent vessels pass to the sacral and sublumbar lymph glands.

## THE SUBLUMBAR LYMPH GLANDS.

These glands are located in the sublumbar region along either side of the abdominal aorta and are usually embedded in the fatty cushion bordering the large blood vessels of the sublumbar region. (See Pl. XXX, 17; Pl. XXXII, 4, 5; Pl. XXXI, 11, 13; fig. 32, *e*.)

The afferent lymph radicles penetrate the lumbar muscular masses and the postero-superior abdominal walls. These glands also receive the lymph from nearly all the glands lying posterior to them, i. e., the internal iliac, circumflex iliac, and sacral glands, and from the internal sexual organs, lumbar vertebræ, and urinary apparatus. It will thus be seen that these are important glands, as they receive lymph from all of the lymphatic vessels of the posterior limb, pelvis, abdominal walls, and the inguinal region.

The efferent vessels pass to the receptaculum chyli lying just beneath the kidneys amid the suspensory ligaments of the abdominal visceral organs.

#### THE RENAL LYMPH GLANDS.

The renal lymph glands are located in cattle in the fatty tissue in the hilus of the kidney on the course of the renal artery. (See Pl. XXX.) In swine they are located on either side of the renal artery where it branches off from the aorta. These glands consist of several small nodes, usually a node anterior and two posterior to the renal artery and not far from the hilus of the kidney. The afferent vessels are derived from the kidneys. The efferent vessels pass directly into the receptaculum chyli, which lies immediately adjacent to these glands.

#### THE GASTRIC LYMPH GLANDS.

The gastric lymph glands are located in cattle in the folds and fissures of the divisions of the compound stomach, especially between the second and the fourth or true stomach, and on the course of the gastric blood vessels. In cattle they are sometimes called the glands of the paunch. There are also on the great curvature of the fourth stomach a number of small nodes.

In swine the gastric glands are large and three or four in number. They are located in the lesser curvature of the stomach and covered by the pancreas. (See fig. 33, *l*.)

The afferents are derived from the superficial parts of the walls of the stomach and from the submucosa of the stomach. The efferent conduits pass upward through the gastric omentum into the receptaculum chyli. A small lymph area on the fundus of the stomach of the hog passes up through the gastro-splenic ligament to the splenic lymph gland lying in the hilus of the spleen.

#### THE MESENTERIC LYMPH GLANDS.

The mesenteric lymph glands are located in cattle in the "ruffle fat," along the lesser curvature of the intestines in the folds of the mesentery, and consist of a continuous chain of glands from the abomasum to the cecum. (See fig. 35, *m*.) These glands are cylindrical segments and vary in size and consistence according to the

stage of digestion, being more voluminous and containing a greater fluid content immediately after or during the digestive period.

This chain of glands in swine is very similar to those in cattle, except that the glands are much farther removed from the intestines, being about in the middle of the mesentery. (See fig. 36, *g*.)

In sheep the mesenteric glands are disposed as in cattle, but instead of there being many interrupted nodes they are long, cylindrical structures as if the glands were fused into one long, continuous mass.

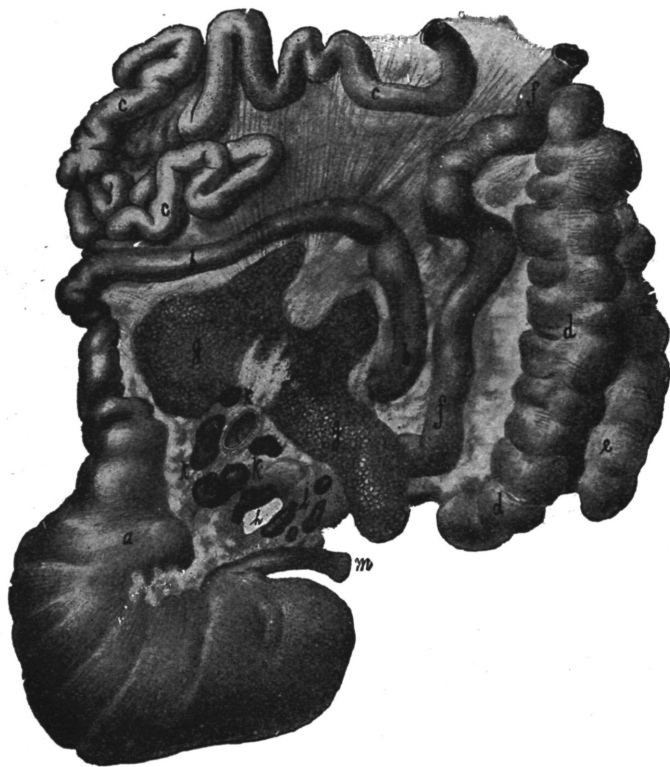


FIG. 33.—Stomach and portion of intestinal canal of hog. *a*, Pyloric portion of stomach; *b*, duodenum; *c*, jejunum; *d*, cecum; *e*, colon; *f*, rectum; *g*, pancreas; *h*, foramen of Winslow; *i*, portal vein; *k*, hepatic lymph glands; *l*, gastric lymph glands. (From Edelmann's "Meat Hygiene.")

The examination of these glands is very important in the detection of tuberculosis, as one or all of them frequently present lesions of this disease, and in quite a number of cases, especially in hogs, they are affected when no other lesions of the disease can be found in the carcass. An experienced inspector can cut into and lay open for examination a considerable number of these mesenteric glands in the hog with a few deft strokes of the knife, but some skill is required in order to throw the intestines in just the right position on the table so as to be able to make the examination quickly, which

is very essential in the large slaughtering houses where rapid killing is the rule.

The afferent lymph radicles are derived from the very rich lymph and chyle plexuses located in the submucosa of the intestines. It is through the medium of these vessels that the chyle is transported. The chyme of the intestines furnishes the lacteals or intestinal villi with the material from which the chyle is abstracted, and this passes through these structures to the chyloferous capillary plexuses in the intestinal wall, then into the afferent vessels of the mesenteric lymph glands. The efferent vessels of these glands—sometimes called lacteals, from the milky appearance of their liquid contents—pass through the whole width of the mesentery to the receptaculum chyli.

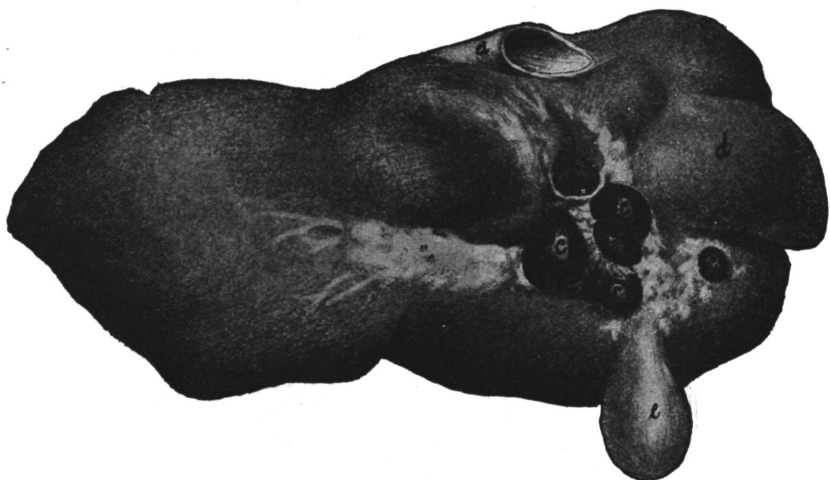


FIG. 34.—Gastric surface of the liver of cattle. *a*, Vena cava; *b*, entrance of the portal vein; *c*, portal lymph glands; *d*, lobe of Spigelii; *e*, gall bladder. (From Edelmann's "Meat Hygiene.")

Also on the colon there are a number of small lymph glands, lying in the folds, which receive the lymph from the walls of the colon and pass it on to the efferent vessels which convey it to the receptaculum chyli.

#### THE SPLENIC LYMPH GLANDS.

These glands are located in swine in the gastro-splenic ligament at the hilus of the spleen near the superior extremity. In bovines these glands lie at the hilus of the spleen between the folds of the splenic ligament, and when the spleen is removed the glands often remain adherent to the paunch. The afferent lymph vessels are derived from the superficial and deep portions of the spleen, and in hogs from the fundus of the stomach. In cattle also no doubt a few lymph radicles are derived from the stomach walls.) The efferents pass to the receptaculum chyli.



## THE HEPATIC OR PORTAL LYMPH GLANDS.

These glands, from three to five in number, in cattle are located on the posterior surface of the liver, embedded in the fatty cushion surrounding the vessels entering at the portal fissure. (See fig. 34, *c*.) In hogs they lie on the portal vein around the foramen of Winslow, and are usually separated from the liver during evisceration, being generally removed with the intestines, and are then readily found in the fat near the gastric lymph glands. They should invariably receive a careful examination. (See fig. 33, *k*.)

The afferent lymph vessels are from the greater portion of the anterior surface, all of the posterior surface, and from the entire

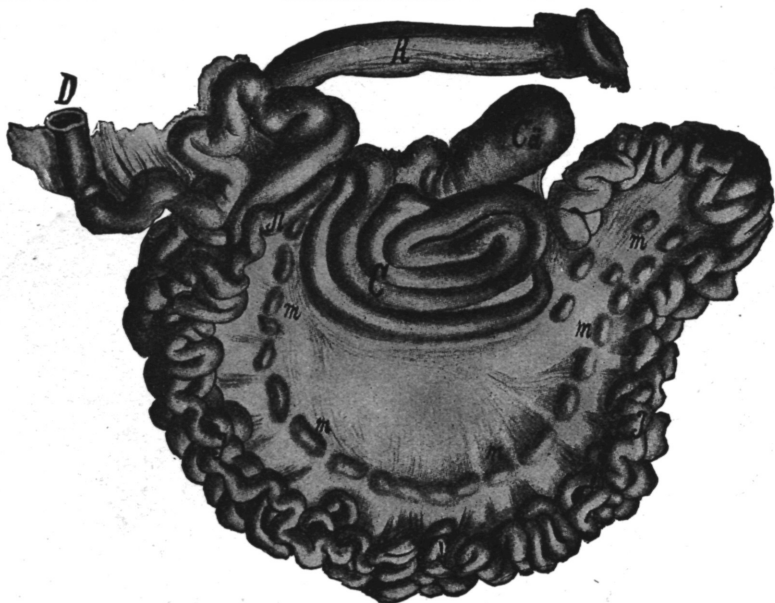


FIG. 35.—Intestinal canal of cattle spread out. *C*, Colon; *Ca*, cecum; *D*, duodenum; *J*, jejunum; *Il*, ileum; *R*, rectum; *m*, mesenteric lymph glands of the small intestines. (From Edelmann's "Meat Hygiene.")

granular portion of the liver. The efferent vessels pass upward along with those from the stomach to empty their contents into the receptaculum chyli.

## THE SUPERIOR THORACIC OR SUBDORSAL LYMPH GLANDS.

These glands are located in the intercostal spaces, embedded in the intercostal muscles and covered by the costal pleura, along either side of the dorsal vertebræ. Their afferent vessels are derived from the intercostal muscles, dorsal muscles, dorsal vertebræ, parietal pleura, and partly from the periosteum and the diaphragm. The efferent vessels pass forward and empty into the thoracic duct. (See Pl. XXX, 13.)

In sheep and hogs these glands are absent, but a chain of lymph glands lie on the aorta just under the dorsal vertebræ. (See Pl. XXXII, 7.)

#### THE INFERIOR THORACIC OR SUPRASTERNAL LYMPH GLANDS.

These glands are located along the course of the internal thoracic vein and artery and are covered by the triangularis sterni muscle at the lower end of the intercostal spaces and lying superior to the sternum.

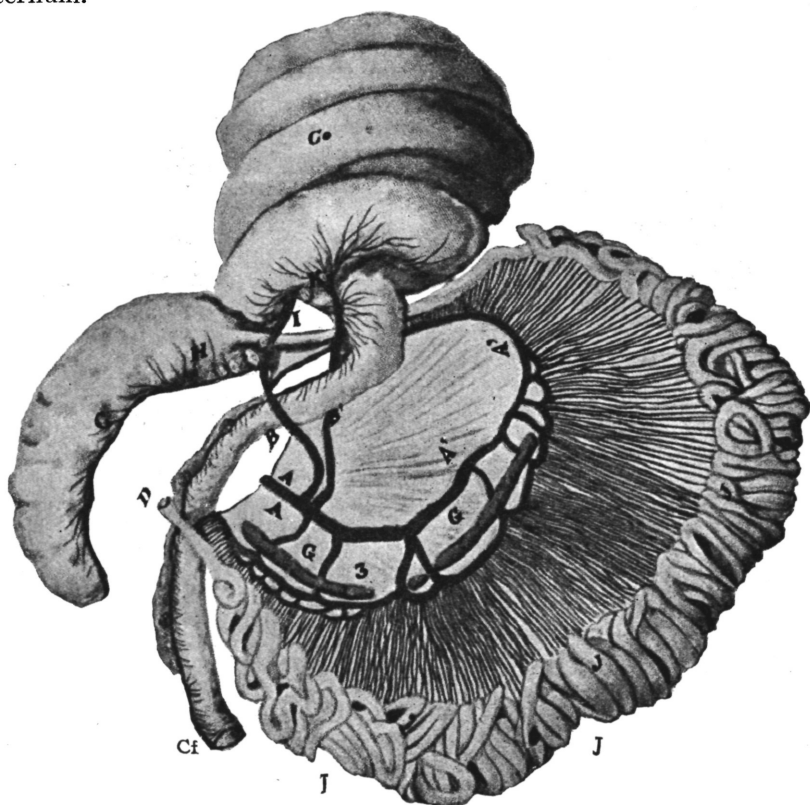


FIG. 36.—Arteries and lymph glands in the intestines of the hog. *A*, Great mesenteric artery; *A'*, arteries of the intestinal mesentery and its subdivisions; *J*, small intestines; *C*, cecum; *Co*, colon; *G*, mesenteric lymph glands forming a chain along the vascular arches of the mesentery; *H*, group of lymph nodes along the course of the cecal artery; *K*, several small lymph nodes on the colic artery. (From Aureggio's "Album Guide.")

The afferent lymph vessel are derived from the rectus abdominis, intercostal muscles, parietal pleura, and diaphragm. The efferent vessels pass to the prepectoral lymph glands in order to gain the thoracic duct, or to the thoracic duct or right lymphatic trunk direct.

It is important to note that in cattle one of the suprasternal glands is sometimes designated the sternodiaphragmatic gland, but this gland is not located in the inferior thoracic chain. It is embedded in the

fatty tissue at the junction of the diaphragm with the sternum. Afferents are derived from pleura and diaphragm, and efferents pass to the suprasternals. (See Pl. XXX, 11, 12, and fig. 30, *a*.)

In swine the suprasternals are usually absent, but in their stead is a large single gland at the articulation of the first and second segments of the sternum. (See Pl. XXXI, 19.) In sheep there is a sternodiaphragmatic gland and a gland disposed in the same manner as in the hog, i. e., just above the first or second segment of the sternum. (See Pl. XXXII, 6, 8.)

#### THE LYMPH GLANDS OF THE THORACIC VISCERA.

The lymph glands of the thoracic viscera may be divided into tracheobronchial and mediastinal. The tracheobronchial glands are located on the walls of the trachea near the branching of the main bronchial tubes, which are given off to the different lobes of the lungs, and are named accordingly. The mediastinal glands are termed anterior or posterior, according to whether they are located anterior or posterior to the heart. The anterior and posterior mediastinum are not of the same significance in the human being and in cattle, sheep, and hogs. The posterior mediastinum in man corresponds to both anterior and posterior mediastinum of domestic animals. It has been thought best to designate the large gland at the anterior portion of the posterior mediastinal space as the median mediastinal gland.

The groups of glands in the region of the lungs (bronchials and mediastinals) are very important to the inspector and should be carefully examined in every case before a carcass is passed for food, as tuberculosis is frequently found in one or all of them, especially in cattle, where these glands seem to be a favored seat of infection. In sheep especially these glands often show the lesions of caseous lymphadenitis.

In hogs the bronchial glands are very well developed and are located usually in pairs in relatively the same location as in cattle. In hogs the efferent vessels pass directly to the thoracic duct.

Along the course of the phrenic nerve as it passes the base of the heart are many small reddish lymph glands embedded in the fatty tissues on either side of the nerve.

Against the pericardial sac just under the trachea is a gland which receives the vessels from this portion of the trachea and visceral pleura. Also on the visceral pleura against the inner surface of the left lung lies another small node which receives afferents from the adjacent tissues.

Dr. F. A. Immler, inspector in charge of meat inspection at Cairo, Ill., has recently called special attention to the presence in the hog of a gland, already known to some bureau inspectors, which varies in size

from that of a small pea to that of a pecan, located between the folds of the visceral pleura and not infrequently in the lung substance on the lower median border of the lung, about 1 inch from its union with the superior median border. Its occurrence is quite variable, but usually it is found much more frequently in the right than in the left

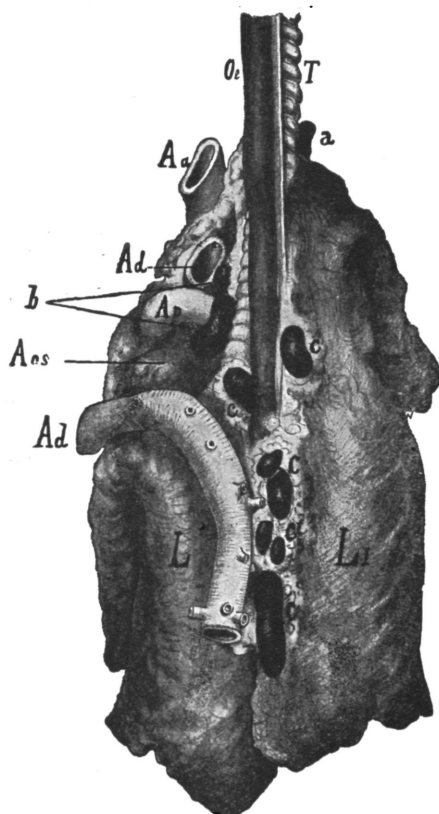


FIG. 37.—Lungs and heart of steer, suspended, dorsal view. *Aa*, anterior aorta; *Ap*, pulmonary artery; *Ad*, posterior aorta; *Acs*, left auricle; *L*, left lung; *L'*, right lung; *a*, right anterior bronchial lymph gland; *b*, left bronchial lymph gland; *c*, median and posterior mediastinal lymph glands. (From Edelman's "Meat Hygiene.")

may be called the median mediastinal, or to the other anterior nodes of this group, then to the thoracic duct.

lung, and seldom a node may be present in each lung. Immler reports this gland present in from 80 to 90 per cent of all hogs, but our observations, covering several thousand hogs, show it to be present in about 12 per cent of them. It appears to receive its efferent vessels from the lung substance, mediastinal pleura, and the liver, as disease of these parts causes alterations in the glands.

#### THE RIGHT ANTERIOR BRONCHIAL LYMPH GLAND.

This gland is located in cattle at the junction of the bronchus of the right supernumerary or cephalic lobe with the trachea, and anterior or somewhat inferior to the bronchus. (See fig. 37, *a*.) In hogs it is anterior and adjacent to the bronchus. (See fig. 38, 2.) The efferent vessels are derived from the right anterior lobe. The efferent vessels pass to the large gland located at about the middle of the posterior mediastinal region and which

#### THE RIGHT POSTERIOR BRONCHIAL LYMPH GLAND.

This gland is located in cattle at the junction of the bronchus of the right main lobe of the lung with the trachea, and is most easily found by turning the lung bottom side up as it lies under the bronchus. For the location in the hog see figure 38, 2. The afferent

lymph vessels are derived from the main right lobe. The efferents pass to the median mediastinal glands, thence to the thoracic duct.

#### THE LEFT BRONCHIAL LYMPH GLAND.

This gland is located in cattle and hogs on the left side of the trachea, anterior to and near the left bronchus, and is normally the largest of the bronchial lymph glands. (See figs. 37, *b*, and 38, 3.) It receives its afferent lymph vessels from the left lobe of the lung, and empties its efferent vessels into the anterior mediastinal glands on the way to the thoracic duct. The bronchial glands of the hog

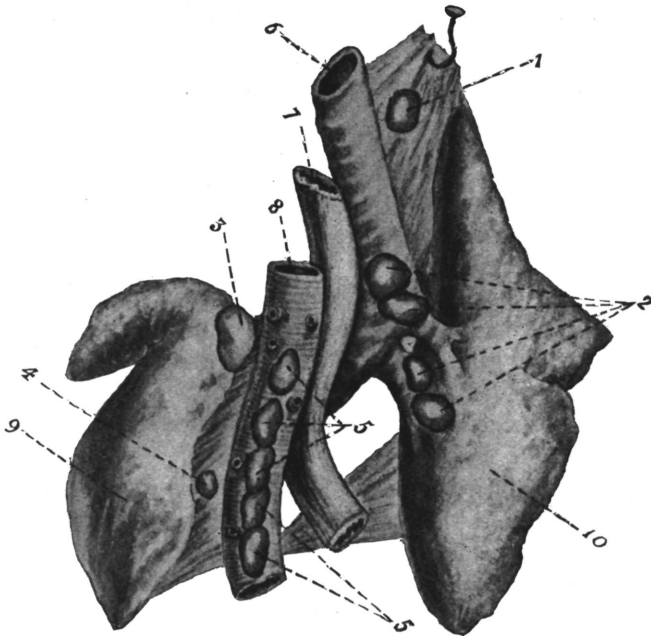


FIG. 38.—Lungs of hog, showing attached lymph glands. 1. Lymph gland on pleura adjacent to pericardial sac; 2, right anterior and posterior bronchial lymph glands; 3, left bronchial lymph gland; 4, lymph gland attached to mediastinal pleura between aorta and left pulmonary lobe; 5, lymph glands on superior face of aorta peculiar to hogs and taking place of posterior mediastinal chain of glands in bovines. (From Aureggio's "Album Guide.")

are usually found in pairs. In cattle there is usually a large single gland, rather deeply lobulated, so that it appears almost like several glands grouped together. This gland is the one ordinarily examined on the killing beds, the procedure being to grasp the anterior lobe of the left lung with one hand and with the other to make an incision across the left bronchus at the root of this lobe which cuts into and exposes the lymph gland for examination.

#### THE POSTERIOR OR MIDDLE BRONCHIAL LYMPH GLAND.

This gland, located at the postero-inferior part of the bifurcation of the trachea into the two main bronchi, is quite a small gland

and is absent in some animals. (See Pl. XXX, 16.) It is always present in hogs, but on the superior part at the bifurcation of the trachea. Afferents are received from the mediastinal pleura and bronchi, and efferents pass to the anterior mediastinal glands.

Sometimes there are several small glands in close proximity at this location, and they probably receive lymph from the deeper lung tissues of the posterior lobes, from the parietal and visceral pleura adjacent, and from the diaphragm. Their efferent vessels pass along the internal face of the left principal lobe and empty into a small gland in the anterior mediastinum just above the base of the heart, thence forward to one of the glands at the apex of the pleural sac, or into the thoracic duct.

#### THE ANTERIOR MEDIASTINAL LYMPH GLANDS.

These glands are located in the folds of the anterior mediastinum in variable numbers. They are small in size and are distributed along the inferior and lateral parts of the trachea and esophagus anterior to the heart and near to the entrance to the thorax. (See Pl. XXX, 15, and fig. 30, *a'*.)

Their afferents are derived from the pleura, esophagus, pericardium, and heart, and efferents from posterior or middle bronchials, thymus, and small glands along the course of the phrenic nerves. Their efferents pass to either the thoracic duct or right lymphatic vein, or to the prepectorals before entering the large terminal lymph trunks.

These glands remain in the beef carcass as a rule after the lungs are removed, and in the dressed carcass the whole group will sometimes be found on one side after it is split, while in other cases one-half of the gland or glands will be found on each half of the carcass embedded in the mass of fat just superior to the anterior segment of the sternum.

#### THE MEDIAN MEDIASTINAL LYMPH GLAND.

This gland is located in cattle in the anterior part of the posterior mediastinal space, and is an anterior node of the posterior mediastinal group. It is quite well developed and is a very important gland, as it receives the efferent lymph vessels of the principal bronchial glands, as before described. The efferent vessels empty directly into the thoracic duct, with which it is in very close proximity. (See fig. 37, *c*.)

#### THE POSTERIOR OR CAUDAL MEDIASTINAL LYMPH GLAND.

This gland is located in cattle at the extreme posterior portion of the posterior mediastinal region and touching the pillars of the

diaphragm. It is the largest of all the thoracic glands and of those known usually as the posterior mediastinal group. (See fig. 37, *c*.) Other nodes also are found in the posterior mediastinal group.

In hogs, along the superior surface of the aorta, are four or five small lymph glands which may be taken to represent the posterior mediastinal lymph glands as found in bovines.

The afferents are derived from the pleura of the surrounding posterior mediastinal region, the diaphragm, the esophagus, and the anterior face of the liver. The efferents pass forward to near the median mediastinal gland, then empty into the thoracic duct.

This gland is frequently left in the dressed carcass, in which case it will be found close to the diaphragm, adjacent to the pillars of this muscle, and should invariably be removed and examined, as it is a frequent seat of tubercular lesions. The anterior node of the posterior mediastinals (the median mediastinal) is also occasionally left in the carcass, where it can be found attached to the inferior dorsal muscles to the right of the aorta about opposite to the interspace between the fourth and fifth ribs. This portion of the gland is quite often erroneously considered by inspectors to be the anterior mediastinal lymph gland.

#### OTHER LYMPHATIC STRUCTURES.

Besides the lymphatic structures above described, there are many lymphatic tissues throughout the animal, of which brief mention should be made. In some of the organs of the body there are lymphatic cellular aggregations more or less extensive, yet hardly large enough to be classed as lymph glands.

Very small lymph glands are found along the course of the smaller bronchi in the lungs.

The spleen is very rich in lymphatic tissues which compose the Malpighian bodies that are so prominent on section of that organ and appear as small whitish nodules in the red matrix.

In the intestines the lymphatic tissues compose what are known as the solitary follicles and the agminated follicles or Peyer's patches. In the terminal part of the small intestines of the hog a Peyer's patch forms itself as a band 4 or 5 feet in length.

In the mucous membranes of other parts also are many lymph follicles, as in the soft palate and the base of the tongue, but particularly in the tonsils and in the posterior nares.

In the way of lymph cavities, it may be well to call attention to spaces surrounding blood vessels of the brain, known as perivascular lymph channels, and around nerve trunks, called perineural lymph sheaths; but these spaces are not dependents of the large lymph system.

The pleural and peritoneal cavities are both thought to be in open communication with the lymph vessels; in the case of the pleura these openings occur in the intercostal spaces, and in the case of the peritoneum on the pillars of the diaphragm. The openings of communication are called stomata. Normally, these cavities contain only sufficient lymph to lubricate the contained viscera.

Stroh has recently recorded the presence of a small lymph gland in cattle at about the juncture of the xiphoid cartilage and the cartilage of prolongation of the last rib.

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